

WE CLAIM:

1. A polynucleotide encoding a variant of a wild-type human  $\alpha 7$  subunit, wherein the polynucleotide encodes a polypeptide having an amino acid substitution at position valine-274 of the wild-type human  $\alpha 7$  subunit polypeptide, and degenerate variants thereof.
2. The polynucleotide of claim 1, wherein the polynucleotide is a polydeoxyribonucleotide (DNA).
3. The polynucleotide of claim 1, wherein the polynucleotide is a polyribonucleotide (RNA).
4. The polynucleotide of claims 1, 2 or 3, wherein the substitution is a threonine for valine-274.
5. A host cell comprising the polynucleotide of claim 1.
6. The host cell of claim 5, wherein said cell is selected from the group consisting of a bacterial cell, a mammalian cell, a yeast cell, an amphibian cell and a starfish cell.
7. The host cell of claim 6, wherein the cell is an amphibian cell.
8. The host cell of claim 6, wherein the cell is a mammalian cell.
9. An expression vector comprising the polynucleotide of claim 1 operably linked to control sequences that direct the transcription of the polynucleotide whereby said polynucleotide is expressed in a host cell.
10. The expression vector of claim 9, wherein the variant human  $\alpha 7$  subunit is the human  $\alpha 7V274T$  subunit.

11. A host cell comprising the expression vector of claim 9.

5 12. The host cell of claim 11, wherein the cell is selected from the group consisting of a bacterial cell, a mammalian cell, a yeast cell and an amphibian cell.

10 13. The host cell of claim 12, wherein the cell is an amphibian cell.

14. The host cell of claim 12, wherein the cell is a mammalian cell.

15 15. A host cell comprising the expression vector of claim 10.

20 16. The host cell of claim 15, wherein the cell is selected from the group consisting of a bacterial cell, a mammalian cell, a yeast cell and an amphibian cell.

17. The host cell of claim 16, wherein the cell is an amphibian cell.

25 18. The host cell of claim 16, wherein the cell is a mammalian cell.

19. A method for producing a variant human  $\alpha 7$  receptor, comprising:

30 (a) culturing the host cell of claim 11 under conditions that allow the production of the variant human  $\alpha 7$  receptor; and

(b) recovering the variant human  $\alpha 7$  receptor.

35 20. A method for producing a variant human  $\alpha 7$  receptor, comprising:

(a) culturing the host cell of claim 15 under

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conditions that allow the production of the variant human  $\alpha 7$  receptor;  
and

(b) recovering the variant human  $\alpha 7$  receptor.

5                    21. An isolated and purified variant human  $\alpha 7$   
subunit, wherein the variant human  $\alpha 7$  subunit comprises an amino acid  
substitution at position valine-274 of the wild-type human  $\alpha 7$   
polypeptide.

10                   22. The variant human  $\alpha 7$  receptor of claim 21,  
wherein the substitution is a threonine for valine-274.

15                   23. A method for identifying compounds that modulate  
nicotinic acetylcholine receptor (nAChR) activity, comprising:

(a) providing a cell that expresses a variant human  
 $\alpha 7$  nicotinic acetylcholine receptor (nAChR) polypeptide having an  
amino acid substitution at position valine-274 of the wild-type human  
 $\alpha 7$  nAChR polypeptide;

(b) mixing a test compound with the cell; and

20                   (c) measuring either

(i) the effect of the test compound on the  
variant  $\alpha 7$  subunit or the cell expressing said subunit, or

(ii) the binding of the test compound to the cell  
or the receptor.

25                   24. The method of claim 23, wherein the host cell is  
selected from the group consisting of a bacterial cell, a mammalian  
cell, a yeast cell, an amphibian cell and a starfish cell.

30                   25. The method of claim 23, wherein said measurement  
of step (c) (ii) is performed by measuring a signal generated by a  
detectable moiety.

35                   26. The method of claim 25, wherein said detectable  
moiety is selected from the group consisting of a fluorescent label, a  
radiolabel, a chemiluminescent label and an enzyme.

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27. The method of claim 23, wherein said measurement of step (c) (i) is performed by measuring a signal generated by a radiolabeled ion, a fluorescent probe or an electrical current.

5 28. The method of claim 24, wherein the host cell is a mammalian cell.

29. The method of claim 24, wherein the host cell is an amphibian cell.

10 30. The method of claim 23, wherein the substitution is a threonine for valine-274.

15 31. A method for identifying a cytoprotective compound, comprising:

(a) providing a cell that expresses a variant human  $\alpha 7$  subunit polypeptide or fragment thereof having an amino acid substitution at position valine-274 of the wild-type human  $\alpha 7$  subunit polypeptide;

20 (b) combining a test compound with the cell; and

(c) monitoring the cell or cellular function for an indication of cytotoxicity.

25 32. The method of claim 31, wherein the cell is selected from the group consisting of a bacterial cell, a mammalian cell, a yeast cell, an amphibian cell, and a starfish cell.

30 33. The method of claim 32, wherein the cell is a mammalian cell.

34. The method of claim 32, wherein the cell is an amphibian cell.

35 35. The method of claim 31, 32, 33 or 34 wherein the substitution is a threonine for valine-274.

36. The method of claim 31, wherein the cell

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comprises an expression vector comprising the polynucleotide of claim 1 operably linked to control sequences that direct the transcription of the polynucleotide whereby said polynucleotide is expressed in a host cell.

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37. The method of claim 36, wherein at least one of the control sequences comprises an inducible promoter.

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38. The method of claim 37, wherein said cell is maintained in the presence of a substance such as to minimize or block a cytotoxic effect on said cell.

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39. A compound useful for treating conditions associated with neurodegenerative processes, enzymatic function, affective disorders or immuno function, comprising a composition that regulates the function of the  $\alpha 7$  variant.

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40. A method of treating an individual having a condition associated with neurodegenerative processes, enzymatic function, affective disorders or immunofunction, comprising administering to said individual an effective amount of a compound that regulates the function of the  $\alpha 7$  variant, in a pharmaceutically acceptable excipient.

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41. A method of treating an individual having a condition associated with neurodegenerative processes, enzymatic function, affective disorders or immunofunction, comprising administering to said individual an effective amount of a compound that controls the gene expression of the  $\alpha 7$  variant, in a pharmaceutically acceptable excipient.

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42. A method of detecting target polynucleotides of human variant  $\alpha 7$  subunit in a test sample, comprising:

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(a) contacting a target polynucleotide of human variant  $\alpha 7$  subunit with at least one human variant  $\alpha 7$  subunit-specific polynucleotide (probe) or complement thereof; and

(b) detecting the presence of the target polynucleotide and probe complex in the test sample.

43. A method for detecting cDNA of human variant  $\alpha 7$  subunit mRNA in a test sample, comprising:

- (a) performing reverse transcription in order to produce cDNA;
- (b) amplifying the cDNA obtained from step (a);
- (c) detecting the presence of the human variant  $\alpha 7$  subunit in the test sample.

44. The method of claim 43, wherein said detection step (d) comprises utilizing a detectable moiety capable of generating a measurable signal.

45. A purified polynucleotide or fragment thereof derived from human variant  $\alpha 7$  subunit capable of selectively hybridizing to the nucleic acid of human variant  $\alpha 7$  subunit, wherein said polynucleotide is SEQUENCE ID NO: \_\_\_ or a fragment thereof.

46. The purified polynucleotide of claim 45 wherein said polynucleotide is produced by recombinant techniques.

1 47. A polypeptide encoded by human variant  $\alpha 7$  subunit polynucleotide wherein said polypeptide is SEQUENCE ID NO: 2 ~~or fragments thereof~~

2 48. The polypeptide of claim ~~47~~ <sup>1</sup> produced by recombinant techniques.

3 49. The polypeptide of claim ~~47~~ <sup>1</sup> produced by synthetic techniques.

50. A monoclonal antibody which specifically binds to human variant  $\alpha 7$  subunit having amino acid sequence SEQUENCE ID NO: \_\_\_ or fragments thereof.

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51. A method for detecting human variant  $\alpha 7$  subunit in a test sample, comprising:

5 (a) contacting said test sample with an antibody or fragment thereof which specifically binds to human variant  $\alpha 7$  subunit, for a time and under conditions sufficient for the formation of resultant complexes; and

(b) detecting said resultant complexes containing said antibody, wherein said antibody specifically binds to human variant  $\alpha 7$  subunit SEQUENCE ID NO:\_\_\_ or fragments thereof.

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